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WE CLAIM:

1. A method of treating substrates in a processing chamber, comprising:

loading a substrate onto a support structure within the chamber;

heating the substrate to at least one treatment temperature;

treating the substrate at the treatment temperature in a treatment position;

after treating the substrate, moving an element within the chamber to bring the substrate and a cooling surface of a heat sink into a cooling position wherein the substrate loses heat to the cooling surface; and

maintaining the substrate and the cooling surface in the cooling position.

2. The method of Claim 1, wherein the substrate and the cooling surface are spaced by between about 0.2 mm and 3.0 mm in the cooling position.

3. The method of Claim 1, wherein the substrate and the cooling surface are spaced by between about 0.5 and 1.5 mm in the cooling position.

4. The method of Claim 1, further comprising removing the substrate from the support structure after maintaining the substrate and the cooling surface in the cooling position, removing the substrate from the chamber, and loading a second substrate onto the support structure.

5. The method of Claim 1, wherein moving the element comprises moving the heat sink.

6. The method of Claim 1, wherein the heat sink is actively cooled.

7. The method of Claim 6, further comprising withdrawing the heat sink from the cooling position to an actively cooled location after maintaining the substrate and the cooling surface in the cooling position.

8. The method of Claim 6, wherein the element comprises the support structure, and further comprising withdrawing the element from the cooling position prior to removing the substrate from the support structure.

9. The method of Claim 1, wherein the heat sink comprises at least a portion of a wall of the processing chamber, and moving the element comprises moving the support structure.

10. The method of Claim 1, wherein the heat sink comprises a cooling plate, and moving the element comprises moving the plate.

11. The method of Claim 1, wherein the cooling surface is substantially parallel to a surface of the substrate in the cooling position.

12. The method of Claim 1, further comprising providing a purge gas to the chamber while cooling the substrate.

13. The method of Claim 1, wherein a chamber pressure is maintained at a level resulting in viscous flow between the substrate and the cooling surface in the cooling position.

14. The method of Claim 1, wherein the substrate remains supported upon the substrate support structure in each of the treatment and cooling positions.

15. The method of Claim 1, further comprising rotating the substrate in the cooling position.

16. The method of Claim 1, wherein the support structure comprises a susceptor.

17. A method for cooling a substrate after treating the substrate at at least one processing temperature while supported at a first position in a processing chamber, the method comprising moving the substrate from a first position to a second position proximate a cold element within the processing chamber, maintaining the substrate at the second position, and transferring heat from the substrate to the cold element until the substrate reaches a handling temperature lower than the processing temperature.

18. The method of Claim 17, wherein the cold element comprises a cold wall of the processing chamber, the wall comprising a material substantially transparent to radiant heat.

19. The method of Claim 18, wherein the wall is actively cooled by forced convection.

20. The method of Claim 18, wherein the substrate has an upper surface, the cold wall has a flat inner surface, and the surfaces are positioned facing and substantially parallel to each other wall in the second position.

21. The method of Claim 20, wherein the upper surface of the substrate and the inner surface of the cold wall are substantially horizontal in each of the first and second positions.

22. The method of Claim 17, wherein adjacent surfaces of the substrate and the cold element are spaced apart by between about 0.2 mm and 3 mm in the second position.

23. The method of Claim 17, wherein adjacent surfaces of the substrate and the cold element are spaced apart by between about 0.5 mm and 1.5 mm in the second position.

24. The method of Claim 17, wherein the processing temperature is between about 1,000°C and 1,200°C, the handling temperature is less than about 900°C, and the substrate is maintained at the second position for less than about 60 seconds.

25. The method of Claim 24, wherein the substrate is maintained at the second position for less than about 10 seconds.

26. The method of Claim 17, wherein the processing temperature is between about 600°C and 1,200°C, the handling temperature is less than about 600°C, and the substrated is maintained at the second position for less than about 60 seconds.

27. The method of Claim 26, wherein the substrate is maintained at the second position for less than about 10 seconds.

28. The method of Claim 17, wherein the substrate is supported by a substrate support structure in each of the first and second positions, and moving the substrate comprises moving the substrate support structure.

29. The method of Claim 17, wherein the substrate support structure comprises a susceptor supported by a shaft, and moving the substrate support structure comprises vertically extending the shaft upward toward the cold element.

30. A method of cooling a semiconductor substrate from a first temperature to a second temperature within a chamber, the method comprising:

moving a cooling member from a retracted position to a location adjacent and spaced from the substrate, the cooling member having a third temperature in the retracted position, the third temperature lower than the second temperature; and

maintaining the cooling member adjacent and spaced from the substrate until the substrate cools to the second temperature; and

lifting the substrate with a substrate handling device after the substrate cools to the second temperature.

31. The method of Claim 30, wherein the cooling member is within an actively cooled structure at the retracted position.

32. The method of Claim 30, further comprising withdrawing the cooling member from the location adjacent the substrate to the retracted position after the substrate cools to the second temperature.

33. The method of Claim 30, wherein moving the cooling member comprises horizontally translating the cooling member to the location adjacent the substrate, the cooling member having a cooling surface substantially parallel and vertically spaced from an upper surface of the substrate.

34. The method of Claim 33, wherein the upper surface of the substrate is spaced by between about 0.5 mm and 1.5 mm from the cooling surface of the cooling member.

35. The method of Claim 33, wherein the cooling member is sheltered within a processing chamber from a heat source at the retracted position.

36. The method of Claim 30, further comprising moving a second cooling member to a position adjacent and spaced from the substrate on an opposite side of the substrate from the cooling member, and simultaneously transferring heat from the substrate to each of the cooling member and the second cooling member.

37. The method of Claim 36, wherein the second cooling member comprises a movable platform beneath a wafer supported on pins.

38. The method of Claim 36, wherein the chamber comprises a cooling chamber adjacent a substrate processing chamber.

39. A processing reactor for high temperature treatment of substrates, the reactor comprising:

a plurality of walls defining a process chamber;

a substrate support structure within the chamber;

a heat source for heating a substrate upon the support structure;

a heat sink within the chamber;

a movable element within the chamber; and

a drive mechanism for moving the movable element between a first position and a second position within the chamber, the first position allowing treatment of the substrate upon the support structure, the second position allowing the heat sink to be spaced from the substrate by a distance sufficiently small to enable significant heat transport between the heat sink and the substrate in the second position.

40. The reactor of Claim 39, wherein the movable element comprises the substrate support structure.

41. The reactor of Claim 40, wherein the heat sink comprises one of the plurality of walls defining the process chamber.

42. The reactor of Claim 39, wherein the movable element comprises the heat sink.

43. The reactor of Claim 42, wherein the heat sink comprises a cooling plate and the plate is stored within an actively cooled pocket in the first position.

44. The reactor of Claim 43, wherein the plate extends over the substrate upon the support structure in the second position.

45. A substrate processing system, comprising a high temperature processing chamber, a substrate holder positioned within the chamber, a cooling member, a cooling shelter configured to shield the cooling member from heat during high temperature processing, a moveable arm supporting the cooling member, and a drive mechanism for extending the moveable arm and cooling member from a first position with the cooling member proximate the cooling shelter to a second position with the cooling member proximate the substrate holder.

46. The substrate processing system of Claim 45, wherein the cooling shelter is actively cooled by circulating fluid.

47. The substrate processing system of Claim 45, wherein the cooling shelter comprises a pocket formed by a plurality of walls surrounding the cooling member in the first position.

48. The substrate processing system of Claim 47, wherein the cooling member is spaced from the plurality of walls by less than about 3 mm in the first position.

49. A cooling mechanism in a substrate processing system, the mechanism comprising:

a support structure configured to support a substrate;

a first cooling element; and

a second cooling element,

wherein the support structure, first and second cooling elements are relatively movable between a cooling position, in which the substrate is proximate and spaced between each of the first and second cooling elements, and a substrate load position, in which a wafer handler can place the substrate upon the support structure.

50. The cooling mechanism of Claim 49, wherein the support structure comprises a plurality of vertically oriented pins.

51. The cooling mechanism of Claim 49, wherein each of the first and second cooling members are actively cooled.

52. The cooling mechanism of Claim 49, wherein each of the first and second cooling members are vertically translatable on opposite sides of the substrate.

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